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AUTHOR Hyde, William D., Jr.  
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## ABSTRACT

The effect of tuition and aid policies on access and choice in education is described, the research through which this knowledge was obtained is examined, and further research that will be useful to the policymaker is suggested. This speech is organized into four sections. The first examines the evidence of the effect of tuition on total enrollment demand and how its effect varies for different ability and income groups. The importance of tuition relative to other types of variables that affect demand is also discussed. The second section addresses the question of how tuition policies influence student enrollments at different types of institutions, particularly public and private. The next section examines the limited research that has been done on the effectiveness of student financial aid and compares its effectiveness to that of changes in tuition. The last section discusses some opportunities for future research. (Author/SPG)

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PAPERS IN EDUCATION FINANCE

Paper No. 1

THE EFFECT OF TUITION AND FINANCIAL AID  
ON ACCESS AND CHOICE IN  
POSTSECONDARY EDUCATION

William D. Hyde, Jr.

Presented at the  
Postsecondary Education Finance Conference  
Denver, Colorado  
November 16-18, 1977

William D. Hyde, Jr.  
Education Finance Center  
Education Commission of the States

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## Introduction

In 1953, Ostheimer published a report for the Commission on Financing Higher Education that contains what is probably the first econometric study of the demand for higher education. The study estimates the effect on enrollment of tuition, income, education, and the proximity of institutions to the population. Despite the research done in this field in the 25 years following Ostheimer's report, neither researchers nor policymakers have much confidence in the results of studies to specify the magnitude of the effect on enrollment of the variables used in this first study as well as of other important variables such as ability and sex. Much of the apparent lack of progress stems from the fact that studies are designed for different purposes and use different data and different methodologies. Variety in research design, while understandable, vastly complicates the effort to determine from study to study improvements in accuracy of parameter estimates regarding the effect of variables, for example tuition and aid, on access and choice, issues which have become particularly important recently. From the policymaker's point of view, results produced by research in the field are often virtually inaccessible on two counts. First, some methodologies produce results that are interpretable only within the study. The values have no meaning outside the study. Second, because of differences in research design -- specifically, the specification of variables in the model -- estimates from study to study of apparently similar variables often vary widely so that the policymaker is hard pressed to reconcile the estimates or to choose among them.

While it is generally more interesting from an academic perspective to design a new study than to replicate earlier work under slightly different

conditions for the purpose of identifying the effect of a particular variable on enrollments under varying conditions, for the policymaker, however, it is the systematic research that generally produces the most useful results. Consequently, for policymaking, it is important to examine the results, scope, and quality of research already done in order to suggest improvements or directions for further research that will be useful. This review attempts to describe what we know about the effect of tuition and aid policies on access and choice in education, to examine the research through which this knowledge was obtained, and to offer directions for further research that will be useful to the policymaker. This review is not meant to provide exhaustive coverage of all the literature on this topic; only selective reference to and discussion of research methodology and results that have a particular significance for the direction and substance of possible future research are included.

Access and choice are defined in a number of ways. The National Commission on the Financing of Postsecondary Education defines access and choice in terms of allowing each individual to "enroll in some form of postsecondary education" [or have a choice among institutions] "appropriate to that person's needs, capability, and motivation" (1973, p. 55). Achievement of these two goals is measured by participation rates. According to this definition and by this measure, equality of access and choice would be achieved when participation rates are the same for populations of different income, race, ethnicity, sex, and residence and when participation rates for different income groups do not vary across institutions categorized by cost of attendance (National Commission on the Financing of Postsecondary Education, 1973, pp. 60-61).

Equal access and choice can also be defined in other terms, such as net price facing students, unmet need, or establishing a free market approach. While these measures may be preferred on conceptual grounds, neither adequate data nor acceptable criteria exist for determining the degree to which equal access and choice are achieved. In contrast, participation rates provide a widely known and clearly understood frame of reference for analyzing the effect of tuition and aid programs on enrollments. In this review they are used as a convenient framework within which policy issues are discussed.<sup>1</sup>

These definitions of access and choice translate into an objective of increasing enrollments for certain groups of people. The derivation of this goal is straightforward. The only politically feasible way to equalize participation rates is to pursue policies that tend to "level up," that is, to raise the participation rates of low-income, low-ability and other groups currently participating at lower rates than higher income and higher ability groups. Because of this political reality, particular attention is given throughout the paper to the effects of tuition and aid on raising the enrollments of low-income and low-ability individuals.

The paper is organized into four sections. The first examines the evidence of the effect of tuition on total enrollment demand and how its effect varies for different ability and income groups. The importance of tuition relative to other types of variables that affect demand is also discussed. The second section addresses the question of how tuition policies affect student enrollments at different types of institutions, particularly public and private. The next section examines the limited research that has been done on the effectiveness of student financial aid and compares its effectiveness to that of changes in tuition. The last section discusses some opportunities for future research.

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<sup>1</sup>Appendix A contains a discussion of three alternative means to assess access and choice.

## EFFECT OF TUITION ON AGGREGATE ENROLLMENT DEMAND FOR HIGHER EDUCATION

Perhaps the least disputed research finding in all the literature on demand for higher education is that aggregate enrollment is negatively related to the tuition level. On the question, however, of how much enrollment will increase for a given decrease in tuition, there is much less agreement. A standard measure for assessing the responsiveness of enrollments to changes in tuition is the enrollment demand elasticity with respect to tuition ("tuition elasticity" for short). Tuition elasticity is defined as the percentage change in enrollment divided by the percentage change in tuition. Using this measure, estimates from different studies can be compared, and to give more meaning to the results, the tuition component of the elasticity is often converted to an absolute amount. A common practice is to relate a percentage change in enrollment to a \$100 change in tuition. While this means of presenting results is more easily understood, the results lose some of their comparability because a \$100 tuition change represents a more dramatic change for a public community college that may have a very low tuition than for a private university with a high tuition.

Even using the tool of tuition elasticity to compare results of different studies does not bring us much closer to agreement on how much enrollment is affected by tuition because results vary by a factor of 10 or more. In an attempt to consolidate the evidence, Jackson and Weathersby (1975) reviewed seven demand studies and made adjustments to the data so that results might be comparable across studies. McPherson (1976) made further adjustments to Jackson and Weathersby's work and included additional studies in another

comparison. McPherson's adjusted figures, reported in Table 1, reduce the disparity among original results slightly, but still the range is wide. On average, one might estimate that a \$100 decrease<sup>2</sup> in tuition will increase the proportion of 18- to 24-year olds enrolled in institutions of higher education (IHE) by .01. Since approximately one-third of 18- to 24-year olds are enrolled in postsecondary educational institutions, this proportion is comparable to a three percent increase in the enrollment rate. Estimates of demand elasticity with respect to tuition, expressed in the conventional form of the ratio of the percent change in enrollment to the percent change in tuition, are low, in the neighborhood of -.1 to -.5. One should remember, however, that tuition is at most half of total costs when commuting or room and board and foregone earnings are included, and often much less. Therefore, enrollment demand elasticity with respect to total costs is at least twice as great as the elasticity with respect to tuition. The consequence of a low tuition elasticity, from a policy perspective, "works against" public policy efforts to increase enrollment. A greater proportional decrease in tuition is required to generate a given proportional increase in enrollment. It does work to the advantage of institutions when they may have to raise the tuition level to meet rising costs. A low elasticity assures them that an increase in tuition will not result in a drop in revenue even if some students decide to leave the institution.

Although students have managed to pay increasing educational costs, they certainly face some limit. Institutions, quite rightly, are afraid that as costs rise tuition elasticity will become greater. At the point at which elasticity exceeds one, an institution will lose revenue if it has to raise

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<sup>2</sup>It is generally assumed that tuition elasticity is symmetrical with respect to increases and decreases. Hoenack (1967, pp. 46-51) indicates that the elasticity for tuition decreases may be slightly larger than for tuition increases.

TABLE 1

THE EFFECTS OF A CHANGE IN TUITION ON  
THE ENROLLMENT RATE: ALTERNATIVE ESTIMATES\*

| Study                           | Type                   | Year    | Price<br>Response<br>Coefficient <sup>a</sup> |
|---------------------------------|------------------------|---------|-----------------------------------------------|
| Corazzini, Dugan, and Grabowski | National cross section | 1963    | 0.62                                          |
| Hopkins                         | State cross section    | 1963    | 0.75                                          |
| Barnes                          | Individual students    | 1970    | 1.53                                          |
| Radner and Miller               | Individual students    | 1966    | 0.05                                          |
| Kohn, Manski, and Mundel        | Individual students    | 1966    | 0.92                                          |
| Hoenack                         | High school districts  | 1965    | 0.71                                          |
| Hoenack and Weiler              | Individual student     | 1972    | 1.46                                          |
| Spies                           | Individual students    | 1971    | 0.05                                          |
| Campbell and Siegel             | Time series            | 1919-64 | 0.20                                          |
| Bishop                          | Individual student     | 1963    | 0.90                                          |

Sources: Derived from the studies given in the first column, all of which are cited in the text (see index). Details of the calculations underlying the price response coefficients, shown in the last column, are available from the author. The calculations require correcting price response coefficients from various studies for price change since base year and for differences in enrollment base.

<sup>a</sup>Increase in enrollment rate of eighteen- to twenty-four-year olds (in percentage points) per \$100 decrease in tuition, in 1974 dollars.

\*Source: Table 9 of Michael S. McPherson's "The Demand for Private Higher Education." In Public Policy and Private Higher Education edited by David G. Breneman, Chester, E. Finn, and Susan C. Nelson. Washington, D. C.: The Brookings Institution, 1978, in press.

the tuition level. On balance, however, the fear of the detrimental effect of rising costs is often overstated. While tuition does increase, ability to pay also rises, and at nearly the same rate (McPherson, 1978). In short, although the tuition elasticity is numerically low, the significance of the elasticity and changes in tuition must be assessed in relation to the effectiveness of other variables that also influence enrollments.

The effect of tuition on enrollments varies across populations; specifically, two population characteristics -- income and ability -- are of major interest. Income represents many of the differences between advantaged and disadvantaged groups and is a capsular variable for socioeconomic status and ability to pay for education. Academic ability (and performance) has always received preferential status in the United States educational system. Even with the trend toward more egalitarianism, considerable funds are expended for merit. High-ability students have greater options, and more incentives exist for high-ability students to attend institutions of higher education.

These two variables are so common that virtually all cost studies include either income or income and ability as variables explaining enrollment; yet not many studies are strictly comparable. Some studies reported in the literature do not provide the data necessary to calculate elasticity estimates. Some studies contain variables highly correlated with income while others do not, so that income elasticity estimates and income coefficients range widely,<sup>3</sup>

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<sup>3</sup>In one of the first analyses of enrollment demand, Campbell and Siegel, (1967, p. 490) using a time series with national data, estimate income elasticity to be 1.20. In cross-sectional state-level analyses Hopkins estimates income elasticity to be .06 (calculated from data presented in Hopkins, 1974); and Ostheimer, .35 (1953, p. 98). While Hopkin's and Ostheimer's estimates are substantially lower than Campbell and Siegel's, some of the discrepancy may be caused by their inclusion of a variable for level of parental education which is highly correlated with income. Excluding this variable results in the income variable "explaining" that portion of the variation in the enrollment rate that is due to education. When Ostheimer excluded education from the regression, the income elasticity estimate increased to 1.08 (calculated from data on p. 89).

although both are always positively related to demand for education -- people purchase more or better education as their income and ability rise.

The one study that bears most directly upon the varying effect of tuition on enrollment for different income and ability groups is a study by Bishop (1975 and 1977) using Project Talent data. Bishop uses a binomial logit model that is fitted by maximum likelihood to the high school student sample, stratified by ability and income. Independent variables include student aptitude, socioeconomic status, family and neighborhood variables including income, tuition, and room and board costs, and variables for income benefits due to schooling and for wages foregone. Tuition and other costs for each individual are measured by the tuition and costs that a student would incur by attending the institution with the minimum total cost of attendance for the individual. In most instances, this institution is the state college or university nearest the individual's home.

Bishop's results indicate that tuition at the minimum cost institution has a strong effect on attendance. The effect, however, is nonlinear across ability groups. Both high- and low-ability individuals are less sensitive than middle-ability individuals to changes in tuition. The tuition elasticities for the first (top), second, third, and fourth quartiles of ability are  $-.050$ ,  $-.181$ ,  $-.471$ , and  $-.072$ , respectively. The existence of scholarships for high-ability students, the greater returns they can expect from an education, and the generally higher incomes of these individuals, which make it easier for them to pay for their education, are probable causes for the reduced sensitivity of this group to educational costs.

The low-tuition elasticity for low-ability students is more difficult to understand without additional knowledge of who these individuals are. One

might speculate that, of the probably small portion of low-ability individuals who do attend, other characteristics that are associated with these individuals, such as, perhaps, motivation and educational aspirations, but that have not been included, account for these students' low sensitivity to the tuition level.

Across income levels, the tuition elasticities are roughly the same except for the lowest quintile which has an elasticity at least twice that for any other income group. This is particularly understandable since the estimated responses for this study are based on attendance at the minimum cost-of-attendance institution for each student. For poverty level students, the minimum-cost school is often the student's only opportunity for further education. A tuition increase will discourage attendance or place it beyond his means. However, the high elasticity for students in this low-income quintile also means that they will be very responsive to any educational policy that reduces cost of attendance. According to Bishop's estimates, a \$100 reduction in tuition (50 percent) would raise the participation rate for this group from .19 to nearly .23 (1975, pp. 11, 13).

Within the 20 ability-by-income categories, only four do not show that the probability of attendance would decline if tuition were raised. One of the four positive, but insignificant, coefficients is that for the highest ability, highest income group. Individuals in this category are most able to attend wherever they prefer; cost is of little consideration. Anyone from this group who chooses to attend his or her minimum cost institution probably does so for reasons other than limited financial resources.

The three other non-negative and insignificant coefficients are found in the low-ability quartile. One of the three coefficients is for the high-income, low-ability group. The attendance decisions of high-income people, regardless

of ability, are generally not very sensitive to costs. The other two coefficients are for middle and low-middle income groups. These individuals may consider themselves not academically qualified for other institutions, and, therefore, to have no real option if they do want to attend an IHE. If the person also has a low income, the situation is different. The person is sensitive to cost even for the minimum cost-of-attendance school. The student simply may not be able to afford a more expensive institution. This is particularly credible given the fact that Bishop used data from 1960 when student financial aid, especially need-based aid, was virtually non-existent, and the only sizable source of educational loans was the National Defense Education Act.

Segments of other studies support and extend these findings. Radner and Miller (1975), using conditional logit analysis (which will be discussed later), explain variation in the probability of an individual enrolling in terms of two variables. One is the ratio of cost (tuition, fees, and transportation or room and board) to income and the other is the product of individual ability and school quality (average student ability). Several of their findings are worth noting here. First, as the ability level of an individual increases, the effect of cost in reducing the probability of enrollment decreases. This is as one might expect given the greater expected returns to education for the more able person. It is also consistent with Bishop's findings, except that the cost elasticity in Radner and Miller's estimates increases further for the lowest ability group rather than decreases, as it does for Bishop's lowest ability group. No particular reason for the difference is apparent.

Second, high-ability students have greater probabilities than others of attending high-quality institutions. This again is expected and consistent with the results of other research. Perhaps surprising is the finding that among low-ability students greater ability reduces the chances of enrolling.

Radner and Miller explain this as a situation in which low-ability students generally have limited educational options and that the more able among them find employment to be a more attractive option than schooling. This interpretation is distinct from the common finding that, over the full range of ability, an increase in enrollment is negatively related to ability for an increase in earning opportunities.

Kohn, Manski, and Mundel (1974), using a conditional logit model separately for three income levels, find that tuition decreases the probability of enrollment more for lower income individuals than for higher income people. They also show that the impact of tuition decreases slightly as the tuition level increases and especially for lower income people. An interpretation is that the high-tuition institutions are also the schools most likely to offer financial aid and thereby mitigate the effect of tuition (pp. 24-25).

Hoenack (1967), in an analysis of enrollment demand at the University of California, finds that a \$100 increase in tuition (proxied by travel costs) will result in a 6.9 percent drop in enrollment for low-income students but only about two-thirds that for high-income students. In a study of applications to high-quality private schools, Spies finds, typically, an increase in likelihood of enrolling as income rises and, specifically, that price elasticity is very low for families with high income as well as for families with moderate incomes. The low-tuition elasticity, in this case, is probably as much a function of the families' particularly strong preferences for attending these private institutions as it is of their incomes.

At this point, the major policy implications of the effect of tuition on enrollment should be summarized. The level of participation in higher education can be raised by lowering the cost, but the cost of increasing enrollments by lowering tuition is expensive. Discriminatory tuition charges favoring low-income

people would be more efficient. It is primarily low-income individuals for whom the goals of equal access and choice are established, and low-income people are more responsive than others to tuition levels. The general effectiveness of a policy that reduces tuition by \$100 is to increase the enrollment rate by about one percentage point. Based on the fact that higher education enrollments equal 35.2 percent of the 18- to 24-year old population, a one percentage point increase represents about a three percent increase in the enrollment rate. With 9.7 million students in postsecondary education (Digest of Education Statistics, 1977, p. 85) a \$100 tuition reduction would attract 291,000 new students. The cost would be \$999.1 million to provide the extra \$100 to all students plus the cost of providing the general, base subsidy for the 291,000 new students. The \$100 subsidy alone would amount to \$3,400 per new enrollee. This strategy is unnecessarily expensive because the vast majority of the students who would receive the additional \$100 subsidy would attend an IHE anyway.

The ideal strategy to fulfill the goal of increasing enrollments, without judging the merit of the goal, would be, first to identify individuals who would not attend without further assistance; second, to rank these individuals by how much money it would take to induce each of them to attend, and, finally to disburse the funds starting at the top of the list and ending when all available funds are expended. This approach, of course, is not feasible -- we have no way of determining who these individuals are. However, since a public policy goal is to raise the participation level of low-income people, targeting a tuition subsidy to this population would be less costly. If, for example, a tuition reduction were offered only to those people with incomes in the lower one-third of all incomes, the average cost per new enrollee would be about \$1,100. Since the demand elasticity with respect to tuition is greater for the low-income person than for the average-income person, the average cost would be less than this amount for a low-income enrollee.

This reduced figure of \$1,100 still seems large compared with the actual \$100 tuition reduction each eligible student would receive. It is worth noting that even using this conservative estimate, over 90 percent of society's costs of enrolling a new student under such a program would result from a failure to identify more precisely the population it is trying to serve. Clearly, any program that could more accurately identify the population that should be served would accomplish the same objective with much less public funding.

The achievement of equal access, in the context developed in this paper, has important implications for the stratification of students and institutions and for broader questions of what an institution's responsibility is to its students and about whom the institutions should be serving. One pattern of long-standing concern is that of very high-ability students attending a limited number of high-quality and typically private schools, thereby homogenizing and reducing the average ability of students at public institutions. More recent is the possibility that as governmental policy promotes greater participation and prompts the enrollment of new students, mostly from the lower income and ability levels, there could develop within public colleges a split between very low-ability students and the rest of the student body. The average ability of new students, who may have been induced to enroll through a low-tuition policy, is lower than the average ability of existing students, not because low-income students may have lower ability than other students, but because high-ability, low-income students are more likely to be already attending. Thus, the balance of low-income students -- those individuals constituting the new enrollees -- have lower average ability. And, if we recall Radner and Miller's findings, it may be that very low-ability students are more attracted to higher education than slightly more able individuals of the same income level. Such a situation raises various questions about whom the institutions should

be serving, who can benefit the most from education or the most without education, and what the role of higher education should be in compensating students for previous educational deficits. Many of these problems are already upon us.

Although variations in empirical results of the impact of tuition on demand are due, in large part, to differences in models, data, and specifications employed, policymakers should attempt to compare the effectiveness of variables and to understand the range over which a policy variable may operate. It is not the intention here to discuss the extensive literature on other policy and non-policy variables such as labor market conditions and sociological factors that affect demand, but they do deserve mention if only to place the effectiveness of tuition policies in proper perspective in terms of what they are likely to achieve. Much of the difficulty in making sense of disparate results reported in various studies is that specifications of similar research problems can be very different.

For the purposes of using research results for making policy decisions, the ideal research design is to specify and then estimate the parameters of all factors -- individual, institutional, environmental, and their interactions -- that influence enrollment demand and then to cost out the necessary changes in the values of the variables to attain particular objectives so that comparisons can be made between policies and their costs. The first step is seldom done, however. Data requirements are extensive and often the objectives of a researcher are not those of the policymaker. Each may prefer different research designs. One prevailing shortcoming of enrollment demand studies that use regression analysis is the failure to identify and separate changes in the supply behavior of institutions of higher education from changes in demand behavior of students and prospective students. Often a study purports to specify a demand model and to estimate parameters without specifying a supply function. The results of such an analysis do not

identify a demand function, but rather a series of intersections of supply and demand curves. Since the supply changes are not known, it is not possible to estimate even the direction of bias caused by such an omission. The observations are useless for describing or predicting likely enrollment behavior. A simplifying assumption that resolves the supply-demand identification problem and one that is often made in regression analyses is to assume that supply is perfectly elastic. The assumption allows one to attribute observed changes to changes in demand. The rationale for accepting this assumption is generally that "there is probably an institution of higher education for virtually anyone who both possesses a high school diploma and has the necessary financial resources" (Campbell and Siegel, p. 488).

This tactic, however, is only as good as the assumption. The alternative is to incorporate supply-side constraints, but this is not easy to do because it is difficult to incorporate into a model supply variables such as legislative considerations and rationing of student places. Furthermore, data requirements are extensive, and statistical complications often confound the analyses. One approach is to specify separate supply and demand equations and then to solve them simultaneously. Another approach has been to incorporate supply variables into a reduced form equation. As surprising as it is, the improvement that a specific alteration makes to the explanatory power of a model is generally not measureable -- across studies, too many characteristics of the analyses differ. There is no way to determine whether more accurate estimates are due to better data, more valid assumptions, or better model specifications. Seldom are predicted values computed and compared with actual values, and then the difference compared with the results of another study. Currently, belief that one method is superior to another rests primarily on theoretical or intuitive grounds. Very little has been done to replicate

studies using controlled variation of data, methodology, or variables. Yet, this type of research would help document the causes of differences in research findings. Work by Carroll, which will be discussed later (Carroll and Relles, 1976; Carroll et al., 1977), is an exception.

In the literature on college-going behavior much work has been done examining the importance of variables of a particular type, such as sociological factors -- family and peers, community and high school, and personal characteristics -- on the probability of attendance. Many of these studies, concerned only with the relative importance of a variable within a specific set of variables, do not include economic variables as well. In studies where both kinds of variables are included, the influence of sociological variables is generally greater and persists either directly or indirectly through other variables, often obscuring the importance of economic variables. In a comprehensive study of higher education attendance by Jackson (1977), variables for school costs, demographic locale, individual's background, high school program, student's ability, occupational expectation, aspirations, and educational plans were all included. In regression analyses, student attributes and student background characteristics gave the most predictive power, but the cost variable was not well specified<sup>4</sup> making a comparison of the effect of the sociological variables with the effect of the cost variable on attendance not very useful. (The cost variable was not even significant in a regression without the sociological variables.) Other studies confirm the greater importance of schooling background, student ability, or socioeconomic characteristics over the importance of cost variables (see, for example, Christensen, Melder and Weisbrod, 1975).

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<sup>4</sup>The cost variable is defined as the average of tuition and fees at four-year institutions within zip code areas (Jackson, 1977, p. 3.9).

However, for policymaking purposes, the comparisons are not very meaningful without converting the units of analysis to some common measure. For example, in an analysis of a hypothetical situation, Radner and Miller show that a low-income, low-ability person is about three percent more likely to attend higher education if tuition is reduced \$100, while increasing the same person's aptitude test (SAT) score by 100 points would more than double his probability of attendance (p. 48). It is necessary to know what it would cost to raise ability 10 percent before any meaningful comparison can be made.

A comparison of the effectiveness of tuition with the effectiveness of labor market variables also yields ambiguous findings for the same reasons and also because of different model specifications. For example, Campbell and Siegel included a tuition variable; Galper and Dunn, a draft pressure variable; and Freeman, employment wages; but none of them entered all three simultaneously, making it impossible to compare the relative effectiveness of these factors. Bishop did include measures for all three of these factors but his measure for the wage variable -- the local college/high school earnings differential -- is a "rather imperfect representation" (1975, pp. 22, 23-24).

Hoerack and Weiler have estimated the effects of tuition on enrollment with and without labor market variables included in otherwise similar analyses. Their estimate of the elasticity of enrollment with respect to tuition (which is consistent with the results of other studies) is not seriously affected by the labor market variables (1977, p. 15, footnote no. 22).

The second step -- of estimating the cost of changing these values to meet policy objectives -- is virtually never done and for good reason. In most instances we simply do not know what it costs in educational resources to raise, say, a student's SAT score or educational aspirations by 10 percent. We do not even know what a student's SAT or aspirations "production" function looks like.

More consideration should be given to these types of alternative ways of influencing individuals' education decisions. For example, if high school track is important in determining whether a student takes further education, an examination of the factors that influence a student in his choice of tracks might reveal that placing more emphasis on better counseling or better information about higher education opportunities or on educational requirements for the labor market would be an effective way to increase participation in higher education. Similar questions can be raised about other sociological and economic variables.

#### THE EFFECT OF TUITION ON ENROLLMENT FOR DIFFERENT INSTITUTIONS

The debate over the effects of varying tuition policies commonly forms around the differential impact those policies have on public and private institutions. The issue is often framed in questions such as, if the public institutions lower tuition, what will happen to the private institutions, or, if student financial aid appropriations are increased, what will happen to the publics.

Unfortunately, collective research results provide a picture less than conclusive. Although a number of studies deal with the cross elasticity and rate of substitution between public and private enrollment, as with the tuition elasticities, estimated cross elasticities vary by a large factor. McPherson has compared the results of several studies, adjusting for price changes and different enrollment bases (see Table 2). The changes in enrollment rate are expressed as a percent of the 18 to 24 year old population. Four, generalizations can be drawn from the table: (a) the effect of a \$100 decrease in price at public institutions is to increase the public enrollment rate about one percentage point (about three percent), (b) the effect of a similar price

TABLE 2

COMPARATIVE PRICE RESPONSIVENESS OF PUBLIC  
AND PRIVATE ENROLLMENT: ALTERNATIVE ESTIMATES\*

| Study             | Type<br>(1)         | Year<br>(2)          | Effect on enrollment<br>of a \$100 decrease<br>in public price |                | Rate of<br>substitution<br>of public<br>for private<br>enrollment<br>(5) | Effect on enrollment<br>of a \$100 decrease<br>in private price <sup>a</sup> |                | Rate of<br>substitution<br>of private<br>for public<br>enrollment<br>(8) |
|-------------------|---------------------|----------------------|----------------------------------------------------------------|----------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------|
|                   |                     |                      | Public<br>(3)                                                  | Private<br>(4) |                                                                          | Public<br>(6)                                                                | Private<br>(7) |                                                                          |
| Hopkins           | State cross section | 1963                 | 0.95                                                           | -0.42          | 0.44                                                                     | -0.20                                                                        | 0.42           | 0.48                                                                     |
| Hight             | Time series         | 1927-72              | 11.40                                                          | -0.44          | 0.038                                                                    | -1.90                                                                        | 0.34           | 5.59                                                                     |
| Barnes            | Individual student  | 1970                 | 1.80                                                           | -0.79          | 0.44                                                                     | -0.46                                                                        | 0.98           | 0.47                                                                     |
| Radner and Miller | Individual student  | 1966                 | 0.11                                                           | -0.08          | 0.71                                                                     | -0.08                                                                        | 0.10           | 0.80                                                                     |
| McPherson         | State cross section | 1972                 |                                                                | -0.64          | 0.72                                                                     | ...                                                                          | ...            | ...                                                                      |
| Peltzman          | State cross section | 1966-67 <sup>b</sup> |                                                                | ...            | 0.57                                                                     | ...                                                                          | ...            | 0.54                                                                     |
| McPherson         | State cross section | 1968                 |                                                                | ...            | 0.58                                                                     | ...                                                                          | ...            | ...                                                                      |

Sources: See sources for table 9; column 5 = column 4 + column 3, except last two figures, which are from the relevant studies; column 8 = column 6 + column 7, except the Peltzman figure, which comes directly from his study.

<sup>a</sup>Changes in enrollment rate of eighteen- to twenty-four-year olds (in percentage points) per \$100 decrease in tuition, in 1974 dollars.

<sup>b</sup>Academic year 1966-67.

\*Source: Table 10 of Michael S. McPherson's "The Demand for Private Higher Education." In Public Policy and Private Higher Education edited by David G. Breneman, Chester E. Finn, and Susan C. Nelson. Washington, D. C.: The Brookings Institution, 1978, in press.

change in private institutions is to increase the private enrollment rate by about half as much, (c) the rate of substitution of public for private and of private for public is slightly more than half what the direct price effect is, and (d) the results vary so widely across the studies (and are derived from various data and methodologies) that not much confidence should be placed in any single figure, although the studies show a consistent direction of effect.

The greater direct price responsiveness in the public sector than in the private sector, as calculated in Table 2, might be expected. A \$100 price change in public institutions represents a larger percentage change than for private institutions.

The rate of substitution of public for private enrollment indicates that a policy to attract new students by reducing price is only half as successful as one might suppose by observing the changes in public enrollments. For each 100 new enrollments in public institutions, half of them are students who would have attended private institutions without the price reduction. It should also be pointed out that, although the rates of substitution of public for private and of private for public are the same, a price reduction in public institutions will be far more harmful to privates than a similar reduction in private institutions will be to publics. The ratio of public to private enrollment is about three or four to one so that a percentage point decline in enrollment in private institutions represents a much more dramatic drop for private than for public institutions.

As much as one would like to make some qualitative assessment of the various estimates given in Table 2, it is difficult to do. Every study has shortcomings; some more serious than others (and the seriousness to another researcher of a shortcoming often, literally, depends on what he believes

relationships and causalities to be in the world). For example, McPherson points out that the particularly large effect found by Hight in a time series analysis may be caused by confusing the tuition effect with other unmeasured effects such as the expansion of higher educational facilities, especially community colleges, and their increasing accessibility which rose over time as did the tuition level.

Results may also differ because different methodologies are used, and each methodology contains different assumptions. There are many criticisms that can be leveled at almost any study -- claims that the data are too outdated and that a variable does not measure what it is supposed to measure are popular ones -- and there are a host of other criticisms of a statistical nature that can be raised about any model. These shortcomings, while certainly important, are common throughout social science research. There is no reason to discuss them here. There are, however, major concepts of model structure critical to demand studies and studies of choice behavior. The identification problem of supply and demand is one that has already been discussed. However dubious the assumption of perfectly elastic supply may be, it is more plausible for explaining aggregate enrollment than for explaining a student's choice among institutions. It is obvious that all institutions are not equally viable for all students. For studies of choice of attendance, conditional logit analysis is a different methodology, adopted from earlier studies of travel demand by McFadden (1973), which several researchers have used recently in education. However, there is a certain trade-off between the two methodologies. Conditional logit analysis addresses the identification problem but introduces its own problem.

The improvement of conditional logit analysis over previous methodologies is that it explicitly considers the set of options an individual has in

estimating the probability that the student will choose a particular option. Each option can be described by a number of explanatory variables and statistically related to the observed choice. The model is derived from choice theory, a utility to the student is calculated for each of his or her options. The probability of a student's attending a particular institution depends on the student's set of institutional options and their respective utilities to the student.

Using this methodology, variables for supply-side constraints -- such as quality of institution, number and type of institutions located within commuting distance of the student's residence, as well as conventional student and environmental variables -- can be included in the specification.

Most of the studies listed in Table 2 use regression analysis, but Radner and Miller use conditional logit analysis.

Radner and Miller chose to use conditional logit analysis because it addresses the identification problem previously mentioned, and it allows for the "joint dependence of the demand for different options" (p. 34). It is interesting to note that their technique, which is particularly designed to take into account the relative attractiveness of institutional options of an individual, shows that their estimate of the rate of substitution between institutional types is at the higher end of the range of values found in the studies reported in Table 2 and that the direct effect of tuition on enrollment

is the lowest of the estimates reported. If these estimates are accurate, the implication is that attracting new students to higher education will be more difficult and that existing students will be more sensitive to changes in costs among institutions than one would expect considering the average of the results.

The strength of conditional logit analysis, making one's probable choice dependent upon the options available to the student, also contains a weakness. The joint dependent relationship one seeks to establish also creates a possible bias in estimated probabilities of attendance at particular institutions whenever an option available to an individual is deleted or a new option is made available. The seriousness of this bias depends on the relative degree of substitution among options. An example, modified from Radner and Miller (p. 34), is used for illustration. Suppose an individual has a set of options consisting of (a) attending a university, (b) attending a state college, and (c) not attending, with probabilities of .5, .3, and .2, respectively. If the university option were removed from the student's set (perhaps because of increased admission standards) then, by the conditional logit formulation, the probability associated with university attendance would be distributed among the remaining options in a way as to maintain the original proportions among the options. The new probabilities for state college and not attending would be .6 and .4, respectively. Whether one is willing to accept this as a reasonable shift in a student's actual probabilities of attendance depends upon what one considers the degree of substitution to be between options. An argument could be made that the university student is more likely to switch to the state college than not to attend, so that the actual revised probabilities might be closer to .7 and .3 than the computed .6 and .4.

If, however, the state college were closed instead of the university it is more reasonable to expect that the student is as likely to switch to the

university as not to attend at all. Thus, distorting relative probabilities of attendance between institutions occurs only if the rate of substitution between the option deleted or added and each of the other options is not equal.

Two other studies have also used conditional logit analysis. One is a study in Hawaii (Ghali et al., 1977) of demand for higher education facing an individual institution. The study shows that enrollment demand at the university is very inelastic,  $-.04$ , as are the cross-elasticities of demand for other higher educational options. The low elasticities in Hawaii are, however, less surprising than the Radner and Miller results. A student's options are limited in Hawaii. The student has one university and limited other higher education alternatives to choose from if he does not leave the state.

The other study, by Kohn, Manski, and Mundel, models the decision making behavior facing a prospective student as two successive decisions: (a) to decide which institution would provide the greatest utility to the student, and (b) to decide if the utility of the individual's "best" institutional option exceeds his utility of not attending at all. Although tuition elasticities could be calculated for this study, the information that is needed is not given in the published report of their research.

Two other approaches have also been used to model student's enrollment behavior. One is that used by Barnes et al. for the Inner City Fund. A student's decision making behavior is seen as an ordered sequence of as many as five binary decisions between one type of institution and the remaining institutional alternatives. The first decision is between going and not going on for further education. The last possible decision is choosing between a two-year and a four-year public institution. The binary nature of the decisions allows the use of dichotomous logit maximum likelihood to estimate the parameters of the model. While this approach avoids the predicament of

the "independence of irrelevant alternatives" (Radner and Miller, p. 34), which has been discussed, the structure raises questions of how well it represents the actual decision making process of an individual. (The price response figures reported in Table 2 for Barnes et al. are from unpublished data of the authors.)

The other approach involves the application of Bayes Theorem. In two studies, Carroll, in conjunction with others at the Rand Corporation in what is perhaps a unique effort to compare methodologies, replicates the Barnes et al. and Radner and Miller studies. His approach is to estimate in two stages the probability of an individual choosing a certain institution. First, the parameters of the distribution of student characteristics are estimated for a given type of institution using ordinary regression analysis, and, then, Bayes Theorem is used to obtain the probability that an individual with particular characteristics will choose a specific type of institution. In contrast, conditional logit analysis uses maximum likelihood to estimate directly the probability that an individual with certain characteristics will attend a specific type of institution.<sup>5</sup>

Although the explanation of the procedure of how the conditional logit probability is determined sounds simpler than the Bayesian method, there are two significant differences between these techniques, and both favor the use of the Rand model. One is the computational cumbersomeness of the conditional logit -- it takes about eight times as much computer time to perform the same simulation as with the Rand technique (Carroll et al., p. 31). Second, the Rand model is more accurate in predicting choice-of-attendance. Although there

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<sup>5</sup> Another study that uses both the conditional logit and Bayesian model is that by Newton et al. (1975).

is not yet an acceptable statistical measure for "goodness of fit" of the conditional logit (Newton, p. 26), Carroll compared predicted and actual attendance figures for his technique with those of Radner and Miller and Barnes et al. The Rand predicted figures deviated substantially less from the actual figures than either of the other studies.

Another distinction should be made between conditional logit and ordinary regression analysis. In a conventional regression, the estimated coefficient shows the relationship between a change in an independent variable and the change in the choice behavior of all individuals in the sample. Conditional logit analysis associates a change in an independent variable with the change in behavior of a few individuals in the sample who switch from one option to another. Furthermore, the effect of a certain change in an independent variable can not be quickly assessed by multiplying the coefficient by the number of units of change in the independent variable. Calculating the change in probability of attendance using conditional logit analysis requires knowing the full set of values for each option in a student's set of options and calculating the probability for the initial set of values and for the changed set. The difference in estimated probabilities then can be related to the change in the independent variable.

The inconveniences, as well as extensive data requirements, do not make this technique an easy one to work with, but it is a substantial improvement in addressing the joint dependency problem that arises in choice-of-attendance studies. This discussion of methodologies suggests how difficult comparative evaluations of studies are because of varying objectives for which a research project is designed. At this point, additional replication studies could help in identifying the importance of certain variables and methodologies.

The results of enrollment response to price changes given in Table 2 show what happens to aggregate enrollments for the public and private institutions. The figures, however, mask different responsiveness among students of different income and ability. The responses vary in the direction of effect and magnitude of the effect. Mention of students' preferences for types of institutions precedes discussion of the enrollment shifts that occur between types of institutions when tuitions are changed. All of the studies that address the question of the effect of income on the preference for public or private education (Barnes et al.; Feldman and Hoenack; Hight; Hopkins; Knudsen and Servede; and Radner and Miller) give evidence that as income rises more is spent on private education than for public education.<sup>6</sup>

Hopkins, running separate regressions for public and private enrollment, shows that public enrollment is negatively related and private enrollment positively related to average state income for higher income families (p. 62). Hight, also using separate regressions for public and private institutions, shows that enrollments increase in both sectors with real disposable income per household, but the income effect is three times as effective in raising enrollments in private institutions as in public institutions. Private institutions are also preferred by higher ability students. Hopkins, using a very general state level measure of ability, shows that as ability increases overall enrollment increases but that it increases more at private than at public institutions.

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<sup>6</sup>The fact that the ratio of public to private enrollment has grown seems paradoxical, but the tuition gap, the recent expansion of the public sector, mainly through the expansion of the community college sector, and possible changes in the relative quality between the types of institutions have more than counterbalanced the income effect.

The issue of how many students and which students switch enrollment between the public and private sectors when the tuition level is changed is the primary purpose of a study by Feldman and Hoenack (1969). They examine the price response of enrollment at public and private institutions for different student ability, income, and sex. Some of their results are counter-intuitive and require explanation. Using interaction terms extensively to estimate the effects of income and ability on an individual's response to a change in tuition, they find the following:

1. In public institutions, a tuition increase reduces the enrollment proportion for higher income people more than for lower income people.
2. In private institutions, a tuition increase reduces the enrollment proportion for higher income people less than for lower income people.

When the data are further divided by sex, the response to tuition for females and males at public and private institutions differs. Feldman and Hoenack find the following:

3. In public institutions,
  - a. For females, at any given income level, the decline in enrollment proportion for a tuition increase for lower ability students is greater than for higher ability students;
  - b. For males, at any given income level, the decline in enrollment proportion for a tuition increase for lower ability students is less than for higher ability students; and
4. In private institutions,

- a. For females, at any given income level, the decline in enrollment proportion for a tuition increase for lower ability students is less than for higher ability students;
- b. For males, at any given income level, the decline in enrollment proportion for a tuition increase for lower ability students is greater than for higher ability students.

The key to Feldman and Hoenack's explanation of these results is that different populations vary in the proportion of its population which is indifferent about continuing its education at the institution they are attending. For example, the observation that higher income students at public institutions are more responsive to a change in tuition than lower income students would be explained by Feldman and Hoenack as the result of higher income students having a larger proportion of their students at the margin than lower income students. Differences between the responsiveness for females and males is attributed to two factors. One is that males can expect higher monetary returns to higher education than females because males typically work longer than females. The other factor is that there probably is a higher positive correlation between expected monetary and non-monetary returns to higher education for females than males. Historically, with little reason to expect monetary returns to education similar to males, females have pursued higher education for reasons more non-monetary than males (Feldman and Hoenack, 1969, p. 377-79).

Feldman and Hoenack's full interpretations are fairly lengthy and involved and are not given here. However, the results should make intuitive sense, if not upon first glance, upon closer scrutiny.

Drawing partially upon other research results than have already been discussed, one can speculate about the individual behavior accounting for most of the enrollment changes. In public institutions when the tuition is increased,

lower ability females may quit school to enter the labor force or to get married more readily than higher ability females. For males, particularly keyed to monetary returns, a tuition increase will cause more higher ability and higher income students than lower ability and lower income students to shift to private institutions where they can expect greater returns to their educational investments.

In private institutions, higher ability and income males have an enrollment demand for private education that is more inelastic than for lower income and ability males. This is consistent with the evidence that high-ability students stand to gain greater returns from higher quality institutions than lower ability students. For females in private institutions, it is more difficult to explain why high-ability students might be more sensitive to a tuition change than lower ability students. Feldman and Hoenack would argue that the larger change in enrollment proportion is because a larger proportion of high ability females who attend private institutions are indifferent to attending than are lower ability females. This scenario could be correct, although it does not seem likely. One possible explanation for this behavior is that among private institutions, females on average attend lower quality schools than males; that is, the private institutions that females attend are more similar to the public institutions in quality than is the case for males.

It is perhaps too easy to point to data shortcomings to explain the unusual results. For example, the data are aggregate state-level data; father's education, through a conversion, is used for income; and cost of transportation is proxied by the percentage of the state population living in urban areas. The results, however, are interesting and unique. A replication

of this study using individual data and including a measure for institutional quality would be useful for checking these results.

Particular attention has been paid to the responsiveness of enrollment to price changes in community colleges. The concern can be expressed in the hypothesis that low-income, low-ability students have no educational alternative to attending a community college. Corazzini, Dugan, and Grabowski show that tuition at community colleges has a significant impact on enrollment only for students in the lowest of four socioeconomic groups and that the tuition at private universities has a significant effect only on the highest two socioeconomic groups. One might guess that the choice for many low socioeconomic students is between attending a community college and not attending at all. Price at the private universities probably does not affect these students because the price is so far beyond their means that it is irrelevant to them or the student is of high ability and able to obtain scholarships, reducing the importance to him of tuition.

In the Inner City Fund analysis, the same question is raised. The fourth decision in the sequence of binary choices is between attending a public college and a non-selective private college. They test the hypothesis that low-ability students are "captives" of the open admission community colleges (p. 34). Using an interaction term, they find that the sensitivity of enrollment to tuition changes at community colleges is positively related to ability. In this instance, where the decision is between two types of institutions, the relative insensitivity of a low-ability student to the community college tuition suggests that he has a less viable educational option than his more academically able colleagues.

Up to this point, the issue of what we know of the different attendance rates between public and private institutions for individuals of differing

abilities and income can be briefly stated. High-income and high-ability individuals participate more fully in postsecondary education than other individuals. Furthermore, as one's income and ability increases, an individual purchases more or better education. Traditionally, this results in some stratification of students among institutions, specifically with the higher ability and income students attending private institutions disproportionate to their numbers. Tuition policies to equalize access and choice by increasing participation rates of low-income individuals, who are also commonly of less than average ability, can be effective, if directed to the populations such policies were established to serve, because low-income individuals are particularly sensitive to costs in their attendance and choice decisions. However, progress toward the attainment of these goals creates other problems.

The idea, raised by Feldman and Hoenack, that differential changes in enrollment rates for different populations are due to the proportion of a population that is indifferent to attending college, points out the questionable wisdom of an educational policy that measures the achievement of equal access and choice in terms of participation rates. If equal access and choice, that is, equal participation rates, were achieved by adopting discriminatory tuition subsidies, some populations, according to Feldman and Hoenack, would have larger proportions of their students indifferent to attending than others. The question that one might raise is why should society make particularly large financial sacrifices to support many students who do not care whether they continue their education, while people who very much want to obtain further education receive less financial support.

Some people would say that preference for education is a matter of taste and that, if the educational system adopted a market approach and insured

the conditions necessary for a free market to operate, individuals could obtain the amount of education commensurate with their abilities, tastes, and time preferences for education. With such a system, one would expect to find across groups nearly equal enrollment elasticities with respect to price.<sup>7</sup> Observed differences in participation rates could be attributed to individual differences.

The fault with this argument is that it is only part of the story. Education is a cultural phenomenon; as such, it is acquired. One's taste for education is an outcome of the education process. While there are undoubtedly genuine differences in individual tastes for education, it is difficult to argue that different personal tastes (as opposed to differences in tastes induced by the cultural environment) account for the observed pattern of attendance when participation rates vary systematically for groups with different income, socioeconomic background, or educational expenditures in elementary and secondary schools. These relationships should be eliminated before one assumes that observed differences in attendance are the result of individuals expressing their personal taste differences for education.

The Feldman and Hoenack study and the other studies on enrollment demand between public and private institutions raise another important issue -- the likely change in composition of an institution's student body as new enrollees with different characteristics enter higher education. Results of studies completed in the last few years indicate that the rate of substitution

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<sup>7</sup>The elasticities might not be strictly comparable across income groups because enrollment levels vary for different income groups. It is more difficult to achieve a given percentage increase in enrollment when base enrollment is nearer either extreme of 0 or 100 percent of the relevant population than intermediate values. Since the enrollment rates for the lowest and highest income groups are about .2 and .6, respectively, this phenomenon should not strongly affect these elasticities.

of private for public education has been about .5. With new enrollees coming predominantly from lower income categories, they are more likely to attend public institutions than generally more expensive private institutions. These students are also generally of lower ability (the able low-income students are already going to school on scholarships) and have few educational alternatives to a low-cost public institution. This could result in a stratification of students among IHEs or a greater homogeneity of student characteristics in the student body of an institution.

An assessment of the degree to which this further stratification in choice may be occurring requires examination of enrollment cross elasticities with respect to price for not just public and private institutions but for institutions of varying quality and mission within both sectors for students with different abilities and income. Radner and Miller estimate cost elasticities for students of different ability and income for nine categories of institutions classified by selectivity and cost which match to some extent public and private institutional categories. Cross elasticities for various educational options, however, could not be computed because of a structural constraint of the conditional logit model used. The "independence of irrelevant alternatives" characteristic results in the same cross elasticity of one option with each of all the other options (Radner and Miller, p. 68).

The question of what should be the balance between public and private sectors and what criteria should be used in making the judgment is not addressed here. However, whether public educational subsidies are distributed through student aid programs or directly to institutions to lower tuitions defines to

to an important extent the balance between sectors. The following section addresses the question of the impact of aid programs on enrollment demand and compares the effectiveness of these programs with that of tuition policies.

#### THE EFFECT OF STUDENT FINANCIAL AID ON ENROLLMENT

There are not many studies on the topic of the effectiveness of student financial aid to increase access or choice. A number of studies consider financial aid in calculating net price (tuition and other direct costs minus aid), but the effect of the aid can not be separated from the overall effect of the net price; so these studies are not discussed.

The effect of aid can be estimated by either using econometrics to estimate the likely response of individuals with certain characteristics or by directly surveying students. The econometric technique is commonly used to estimate enrollment shifts for tuition changes, but its use for analysis of the effect of aid has been limited. The major reason for its infrequent use in aid studies is that the data necessary for the application of econometrics have not been available.

The survey technique is to ask aid recipients what they would have done without the aid provided by a particular program or to ask individuals what they would do if a certain amount of aid were given to them. The three mutually exclusive responses for an aid recipient are (a) the student would not change his plans, (b) he would attend a different institutions, and (c) he would not attend at all. The number of responses indicating that a change would occur are tallied and used to compute the enrollment change. From this, an enrollment elasticity and cross elasticity with respect to aid are estimated.

From the studies on aid, there are four general results. The first three are primarily the results of work by Carlson (1974, 1975) and Leslie and

Fife (1974). While these outcomes are not surprising, they are worth mentioning. The fourth is a set of several less-expected findings by Jackson (1977).

The first is that a large proportion of aid recipients say they would not attend without the aid. For grants, between one-third and three-fourths of the recipients said that the grant affected their choice of institution or their decision to attend (Leslie and Fife, 1974, p. 659; Carlson, 1974, p. 25). On average, about one-fourth of work-study recipients responded similarly (Carlson, 1974, p. 19).

Since the purpose of aid programs is to increase enrollment and choice among institutions, ideally, one would like to make aid awards as small as possible and still have each award make a difference to the recipient in his enrollment decision. The average of about 50 percent of recipients' attendance or choice decisions being affected by the aid (Carlson, 1974, p. 25) is far short of the ideal of 100 percent but considerably more effective than the perhaps 5 percent change that would probably result if aid were available to everyone.

Second, the effect on enrollment of receiving aid is less than the effect of a change in tuition. On average, a \$100 change in tuition results in about a one percentage point change in the attendance rate (equal to about a three percent change in the enrollment rate). Weathersby (1975, p. 605) using data from Leslie and Fife (1974) calculates that a \$100 increase in state grants to students will increase the enrollment ratio by .6 percentage points. Carlson finds that \$100 grant through the federal Supplemental Education Opportunity Grant (SEOG) program increases the enrollment rate by just less than one percentage point for students from families with

low incomes and less than .1 percentage points for students from middle income families (Carlson, 1974, p. 25).

The difference in response to aid and tuition financial assistance is probably a function of the information a prospective student has about costs of attendance. A student may not know the availability of student financial aid and may be uncertain about his eligibility for aid until after the student matriculates. Consequently, many students may decide not to enroll, given these doubts; whereas, an aid policy that manifests itself through low tuition is a more discernable, constant cost that a prospective student can depend on while making a decision.

An analysis of several different state and federal aid programs also shows that, as with tuition, (a) the impact of aid on enrollments lessens as income rises, (b) the relative effectiveness of aid is greater for lower income than for higher income students, and (c) aid is more effective at private institutions than at public institutions (Carlson, 1974, 1975).

The third finding is that grants are more effective than either loans or work-study programs. Table 3, drawn from Carlson (1975, p. 62), gives the ratio of the price response coefficient for aid to the price response coefficient for tuition for categories of family income and type of aid within the public and private sectors. The tuition response coefficient is derived from the results of a New York survey of students who were questioned about what their enrollment decisions would be if they received a \$1,000 tuition waiver. The first figure in the table, .89, means that a grant is 89 percent as effective as a change in tuition of the same amount in affecting enrollment decisions of low-income students at public institutions.

Looking at the table one can see that a grant is about twice as effective, relative to the effectiveness of a change in tuition, as either a loan or work

TABLE 3

RATIO OF PRICE RESPONSE COEFFICIENT FOR AID TO  
PRICE RESPONSE COEFFICIENT FOR TUITION

| <u>Type of Aid</u> | <u>Family Income of Student</u> |               |             |
|--------------------|---------------------------------|---------------|-------------|
|                    | <u>Low</u>                      | <u>Middle</u> | <u>High</u> |
| <u>Grants</u>      |                                 |               |             |
| Public             | .89                             | .21           | .10         |
| Private            | .79                             | .22           | .10         |
| <u>Loans</u>       |                                 |               |             |
| Public             | .48                             | .26           | .03         |
| Private            | .44                             | .39           | .11         |
| <u>Work Study</u>  |                                 |               |             |
| Public             | .40                             | .16           | .02         |
| Private            | .47                             | .28           | .05         |

Source: Carlson, 1975, p. 62.

study for students from both low- and high-income families. It is surprising to find this disparity lacking among students of middle-income families because a dollar of aid in the form of a grant is worth more than a dollar of aid in the form of either a loan or work. For middle-income people, however, loans are more effective relative to a change in tuition than are either a grant or work study. One possible explanation is that the size of the aid may be a factor. On the one hand, students of middle-income families generally do not qualify for large grants, if at all, and work study programs generally provide \$300 to \$500 to a student during an academic year. On the other hand, they frequently obtain loans of \$1,000 or \$1,500 per year. Although the price response coefficients are standardized to a change in cost or aid of \$100, the actual dollar amounts of the awards to which the responses were made vary. By illustration, the probability of increasing enrollments may be greater by offering one student \$1,500 of aid than offering \$100 to each of 15 students. The \$1,500 award may meet the financial need of a student while \$100 is not enough to make any difference in a student's financial capability to attend. One could expect to find this behavior more common among private institutions that generally have higher costs of attendance than public institutions. The relatively high ratios in Table 3 for students from middle- and high-income families in private institutions would be explained by this situation.

Two flaws arising from the use of these surveys for assessing the relative effectiveness of the different aid programs deserve mention. One is that the difference between the effectiveness of grants and loans or work studies is overstated in the estimates presented in Table 3. Although loans and work studies are awarded more to non-freshmen than are grants, the sample was drawn from all aid recipients. While the prospect for aid in subsequent years of enrollment

may have some impact on one's decision to begin the first year, the effect is probably a small fraction of the effect that aid has offered in the first year. A sample of only first year aid recipients would eliminate this downward bias of the effectiveness of a loan or work study.

The second shortcoming involves the measurement of the preference for a loan versus work study. Carlson had no student survey for loan recipients. Drawing upon the preferences of financial aid officers, who prefer to offer grants to freshmen and loans and work studies to upperclass students, he assumes that the percentage of loan recipients whose enrollment decisions were affected by the aid is the same for work study recipients. The flaw lies in the fact that a preference by financial aid officers for disbursing loans and work studies does not imply that students have the same preferences.

This work by Carlson is the only study of its kind. More research would be useful comparing the effectiveness of different aid programs based on survey or econometric design.

The last set of findings is drawn from Jackson's recent doctoral thesis (1977). Studying students sampled from the National Longitudinal Study of the High School Class of 1972, he separates the application decision from the attendance and choice decisions in his analysis of the different effect of cost and aid on these decisions. Instead of examining the effect of different types of aid, he compares the effect of the offering of aid, without regard to amount, with the effect of the amount of aid.

Separate analyses for the application and attendance decisions show that considerable pre-self-selection occurs before an individual applies. Jackson finds that the characteristics of the schools to which an individual applies are more similar than would be if the student applied to a full range of IHEs (5.12). Within this narrowed range of institutions to which a student applies,

total cost is not a noticeable factor in a student's decision to attend. The effect of cost is upon the student's decision of where to apply. Similarly, the dollar amount of aid offered is not important in influencing the student's decision to attend, but it does affect his choice of institution. An offer of a hundred dollars of aid increases the likelihood that an applicant will attend by .1 percentage points, but \$100 of aid offered by a particular institution increases the likelihood of an applicant's choice of that institution by 1.5 percentage points (7.12).

Thus, it appears that once a student has decided to which institutions he will apply (and how expensive a school he can afford), cost and amount of aid do not affect his attendance decision, but he is sensitive to cost considerations in choosing among institutions to which he applies.

While dollar value of aid did not affect the applicant's attendance decision, awarding aid, regardless of amount, did. In regression equations containing variables both for amount of aid and aid award, the effect of aid award swamped the effect of the amount of aid on both the probability of an applicant attending and on the probability of an applicant choosing a particular institution. One might speculate that the act of awarding aid has a strong psychological effect, conveying to the student a sense of "we want you" which is an important qualitative factor in his decision.

Based on these findings, some interesting experiments could be performed to determine the minimum amount that an award would have to be to have the desired psychological effect. One might then speculate on how much more efficient a public policy to increase participation or choice among institutions might be under alternative compositions of number of awards and their amounts of aid. It should be remembered, however, that this behavior is observed among people who decide to apply. With respect to the issue of

access or attendance, a greater concern might be with the 40 percent of high school seniors who do not even apply. With respect to increasing choice, of the 43 percent of high school seniors who do apply, more attention might be placed on the majority of applicants who file only one application.

#### OPPORTUNITIES FOR FUTURE RESEARCH

Ideally, we would like to base our policy decisions on sound theoretical constructs supported by good empirical results. In the current research situation, the theory of behavior implied by the structure of models is sometimes questionable, and the empirical results are of varying magnitude. Given this state of the art, it is difficult to accept any particular set of results over another, and an "average" result does not take into account any qualitative differences. Thus, at the outset, it is difficult to abstract from the body of research on the effect of tuition and aid programs on demand for higher education and student choice among institutions those facts most dependable for policy making. Before I discuss the "knowns" and "unknowns" that I see emerging from this review of the literature, let me mention two general directions in which research on demand for higher education ought to go.

First, a striking characteristic of this body of literature is the large differences in the magnitude of effects found among studies of the same parameters. The differences are probably in large part the fate of working in the social sciences but also the result of working in a new field that has particular theoretical, methodological, and data problems yet to be resolved. The need for replicative studies with controlled variation is paramount. They provide a sort of "quality" control, showing the advantages of one method or the superiority of one variable over others for predicting individual attendance and choice decisions. At the moment, Carroll and Relles (1976) and

Carroll et al. (1977) are the only two replication studies that have been done. Replicative studies are, in effect, an in-house research need by which we build a body of theory, models, and methodology, that is, tools, in which we may have some dependence.

The second general need is for more detailed, specific analyses. Many studies measure only aggregate demand. Other studies that are disaggregated are often disaggregated only to large components, such as the public and private sectors. This degree of aggregation obscures other important variables. For state-level analysis, institutions should be defined along many dimensions, as some studies are beginning to do, by including, for example, variables for quality of the institution, diversity of offerings, and level of program as well as cost and aid variables.

To design better programs, it is necessary to understand more specifically individual behavior with respect to an individual's decision to continue his education or his choice of an institution. Results of research to date suggest that our models have not captured all the important variables that explain individual behavior. Significant progress in this direction is going to require studies that focus on a small enough unit to permit accurate specification of influences on college-going or college-choice behavior which cannot be included at an aggregate level. A study of enrollment demand in a state, for example, might include such factors as differences among available institutions in quality, variety of programs, recruitment procedures, and costs or state regulations and administration of aid programs or other factors. Replicative studies in other states would be useful for identifying the importance of unique state factors.

In essence, there is a need for inquiry into the results of policies, primarily because continually changing demographic circumstances create a need

for ongoing research. This type of research is perhaps what is most immediately important to decision makers who are most often concerned with marginal changes of existing programs, but such research does not provide any insight into the behavior of individuals. We are going to have to design studies that map with greater precision within a small unit the factors that influence a potential student before we can hope to develop a reliable college-going or college-choice model useful to state policy makers.

Following is an enumeration of seven topics, drawn from the literature review, about which we have varying knowledge and about which we have varying research needs.

1. An undisputed finding is that changes in tuition level are negatively related to enrollment changes. The magnitude of the effect is small, generally of the order of a two or three percent change in the enrollment rate of a \$100 decrease in tuition. This generality, however, can be dangerous in its simplicity because the broadness of the generality obscures important distinctions critical to an analysis of access and choice. First, the effect of tuition is not the same for all students at all institutions. Ability, income, and sex of the student and type and quality of institution alter the effect that tuition has on enrollments. Second, even if tuition, which represents only a fraction of total costs, were reduced to zero, the student would still have substantial costs -- not assuring, as often claimed, that financial barriers to attendance are eliminated. Third, a reduction in tuition at public institutions makes more difficult the achievement of equal choice since the tuition gap between public and private institutions becomes larger. Fourth, cost is only one aspect in a student's decision to attend an IHE; we should not dismiss non-price factors that may be even more important than tuition or total

cost. The widely ranging estimates of studies of the effect of tuition on enrollment is testimony of the failure to include unidentified, but important, variables in the analyses. Furthermore, analyses must be disaggregated to be useful to a state or to an institution.

2. We also know that a policy that aims to achieve greater equality of participation rates by lowering tuition is not an efficient mechanism for achieving equal access and choice. A policy that channels tuition subsidies or student aid to low-income people, and increasingly to middle-income people as well -- the intended recipients of such programs -- will result in a more efficient use of financial resources than an overall tuition reduction. The effectiveness of targeting aid is further enhanced by the fact that low-income people -- the target of such aid -- are more responsive to cost considerations than higher income people.

As for policy implementation, this research finding is a well established fact and one that the federal government has already acted upon. The legislature has for several years increased appropriations for individual student aid programs that target aid to certain populations of prospective students.

Achieving equal access and choice have serious implications for educational institutions. As progress is made toward equalizing participation rates, the number of low-income, low-ability, and educationally disadvantaged people enrolling increases. The institutions, serving a more diversified student population, are caught in the position of providing remedial education to some of their students while simultaneously trying to maintain program quality for conventional students. Questions of what an institution's responsibility is to its students and of how the composition of the student body might change are side-effects of achieving these policy goals and deserve more attention.

3. The strategy by which equal access and choice are achieved -- via student aid -- is also of concern to the institutions. Channeling aid through the students rather than through the institutions adds to the institutional anxiety over the degree of enrollment substitution that may occur among institutions, as do institutional decisions to change tuition levels. McPherson has shown that the rate of substitution between public and private institutions is about .5, which means, for example, that for each two additional students that enroll in the public sector as a result of a change in public tuition, one of them is a new enrollee in higher education and the other is a student switching from the private sector.

Again, as with the first topic regarding tuition levels, estimates of the rate of substitution between institutions have all been based on broad categories -- on the substitution between the public and private sectors. On a more comprehensive, micro level of analysis, the rates of substitution are likely to vary more widely. For policymaking at the state level, estimates of substitution among institutions should be more institutionally specific and include such things as program diversity, quality of program, level and area of instruction, and proximity of other institutions as well as tuition and cost variables. The non-price factors, while perhaps difficult to quantify, must not be omitted.

4. The greater efficiency of individual financial aid over general tuition reductions in increasing enrollments is virtually undisputed, although there are questions of why tuition reductions appear to be more effective than aid programs in increasing enrollments.

One might argue that the effectiveness of a tuition reduction exceeds that of a loan or work study aid program simply because the tuition reduction is

worth its face value; whereas a loan or work study is worth less than the face value because the loan must be repaid and the work study award earned.

The apparent greater effectiveness of a tuition reduction than a student grant, both of the same face value, seems to arise from the greater certainty or visibility of the tuition price. A common criticism of aid programs is that a student may not know his eligibility status or the amount of aid he is likely to receive until after matriculation. If this is the case, it is questionable how much effect aid awards can have on one's decision to attend. A state's administrative procedures in managing aid programs could have substantial impact on the effectiveness of aid programs. The administrative practices probably vary widely from state to state. To estimate the extent to which administrative practices curtail or enhance the effectiveness of aid programs, one could make a comparison of state aid programs by using identical analyses for several states separately. Differences in the impact of aid on attendance and choice of institution could then be attributed to differences in administrative practices. There is also a need to compare the relative effectiveness of different types of aid programs. Efforts to date are few, they are limited to the research technique of quiring aid recipients or prospective recipients about whether they would make different decisions with or without aid from the decisions that they did make. One drawback to this approach is that an individual's response to a hypothetical situation may not correspond to his actual response.

An econometric analysis based on revealed preferences through actual choices made by individuals would be a worthwhile undertaking. Perhaps methodological considerations and the questionable accuracy of existing data have prevented such a study from being done. Multicollinearity between aid programs is also a common problem. Seldom is aid offered strictly in

grant form; it is generally offered as a package with a grant portion and a loan or work study portion. Nevertheless, I think that a study of this question, using either the National Longitudinal Study of the High School Class of 1972 (NLS) data (as imperfect as they are) or the data from a Student Resource Survey (SRS) administered throughout a state and supplemented with additional data is worth doing to estimate the enrollment response that various aid programs generate.

From a policymaking perspective, determining the different effects that aid programs have on enrollment is only the first of two parts of the necessary analysis. The second part is determining the efficiency of the programs, costing out alternatives and identifying the policies least expensive per unit of output. I am aware of no research in education on this topic that has made cost comparisons. Studies assume that a loan is equivalent in value (to a student) to about half that of a grant of the same amount (although it depends upon the loan provisions and student debt aversion) but estimates, however crude, of what it costs to provide a loan or work study job seem non-existent. If valid and reliable data existed, much could be done to identify the optimal mix of aid programs.

5. There is also a need to consider broader policy variables. Studies that incorporate sociological, educational, and economic variables place the importance of changing costs in a different perspective. The ability of individuals, their socioeconomic characteristics, and their schooling background have stronger effects on the probability of attendance than costs and aid. Again, while these variables, many of them not easily altered, may be more effective than tuition charges, there is no evidence of whether the educational objectives could more efficiently be achieved by changing these non-price variables or by altering tuition and other costs. Of course, some

variables such as high school curriculum track, are intermediary variables and are not considered direct policy variables. For example, although high school track is a strong predictor of college attendance, it is fallacious to expect that simply transferring a student from one track to another will change his probability of attendance. Such reasoning ignores the fact that students have particular dispositions, abilities, interests, and aspirations and choose particular tracks. It, indeed, would be startling if on average a student found in the "college preparatory" track did not have a greater probability of attending an IHE than a student in the "general" track.

A similar argument could be made for making income transfers for the purpose of affecting educational attainment. Although there is a positive relation between income and level of education, the assumed causality of income on education may be due in large part to the relation of income to other socioeconomic variables or psychosocial variables. Changing a person's income by transfer payments might result in increased education but the effect would be smaller than expected because the other factors related to income and influencing the preference for education have not changed.

There are variables, however, that policy can meaningfully alter and that should be evaluated as possible instruments for achieving the goals of greater access and choice. For example, about half of all high school students do not ever give serious thought to attending postsecondary education. While many of these students are low-ability, low-income students, many institutions offer programs that would probably benefit these people. Do these individuals have sufficient information about educational options available to them? If they do not, would better guidance and counselling at the secondary level help, and how expensive would it be to upgrade the counselling to realize these benefits? Could low-income students, who rely more heavily upon information

of counsellors than other students (Leslie, Johnson, and Carlson, 1977, pp. 283-84), be made more interested in school and persuaded to change curricula, or might the counsellor, by presenting an accurate picture of employment opportunities in the labor market, convince a student of the wisdom of continuing in school? On the face of it, one might suppose that spending a million dollars on better counselling of low-income students at the secondary level could be more fruitful in affecting postsecondary enrollments than spending the same amount on student financial aid programs in postsecondary education.

6. One subject about which we do not know very much is individual behavior in decision making. Our understanding of what decisions a student makes and what influences those decisions between his senior year in high school and enrollment in an IHE is inadequate. How important is accurate information about costs and aid, available IHEs, and educational programs in an individual's decisions about postsecondary education? Why do so many students who do apply to an IHE apply only to one institution? Why is cost and aid assistance important for those choosing among several institutions but of practically no concern to applicants in deciding to attend? An hypothesis is that a high school student decides, before he actually applies, what constitutes a reasonable set of educational options in terms of cost, selectivity, and type and level of educational program. By the time the student applies, extensive self- pre-selection has already occurred. The individual's perception and knowledge of options undoubtedly affect his selection. In the case of a multiple applicant, the decision to attend is practically foregone. The question to this applicant is "where" (Jackson, 1977). In the case of the single applicant, the individual may be a marginal student. His best alternative to attending the institution to which he has applied may be a

non-school option or attending an institution that does not require an application much in advance of matriculation. But this is only speculation. The single applicant may not have any viable educational alternatives, or he may not be aware of the available alternatives.

There are two sources of data commonly used to seek empirical resolution of these kinds of questions. The most comprehensive is that of the NLS. A questionnaire was administered to a national sample of high school seniors in 1972 with two follow-up surveys completed to date. The initial survey and the first-year follow-up provide a lot of data that can be used for analyzing individual decisions during the transitional year between high school and college.

The NLS survey, despite its comprehensiveness, is not as useful as one would like. At the time the survey was taken, the large federal aid programs that have become key variables in analyses of the effectiveness of aid programs were only beginning in 1972. Although the survey contains questions about a student's participation in federal aid programs, not many students were involved in that first year and the data may contain start-up irregularities.

Data are also available from surveys administered by educational testing agencies such as the American College Testing Services (ACT) which administers a battery of tests to high school students who are considering further education. Information is collected on a student's educational background and plans and vocational interests and can be matched with the student's academic aptitude and financial need.

The usefulness of these data for addressing access and choice questions is limited because the ACT student questionnaires do not contain information on costs of attendance or aid offered the student, nor is there any information

about a student's perception of costs and institutional options, which the NLS does include, and which may be important intermediary parameters that have been omitted from studies to date.

Another data source is the Student Resource Survey (SRS), developed by the College Entrance Examination Board. It is given to students in higher educational institutions to assess the financial resources available to the student. It collects almost no information about the student's socioeconomic characteristics and educational experiences. As with the ACT questionnaires, the SRS is intended primarily for use by individual institutions but has been used for state-wide analysis.

Matching respondents to an SRS survey with students completing the ACT assessment questionnaires would create a data base that might serve as an alternative, for some research questions, to using the NLS although the matching process might create problems of bias from omitted observations, if the match could in fact be made.

A substantial advantage of the NLS data over either the SRS or ACT is that it contains information on individuals who do not attend or even apply. A complete analysis of college-going behavior requires the inclusion of information about these individuals. Furthermore, the NLS has information on the actual institutions to which an individual applies and attends. Researchers using the conditional logit specification in earlier analyses have imputed choice sets of institutions for each individual. An interesting replicative study would be to use the actual institutions that a student selects.

7. The purpose of this last point is not so much to present a specific research topic as to enter a caveat concerning the extrapolation of current research results to a changing educational system and to mention the need for recurring studies based on changing enrollment patterns.

The concern arises from the fact that the demographic characteristics of the student population is changing. New students in higher education are not representative of the existing majority of students. More of them are independent, part-time students, and older. Many analyses are based on conventional collegiate populations (those going directly from high school to college at age 18), but an older, more independent population may not have the same price responsiveness as those students upon which the price response estimates were based. Enrollment projections during the coming decline of the 18-22 year-old cohort will depend largely upon the responsiveness of this older population.

If we come down in the end to the basic questions, what do we know about the impact of tuition and aid on access and choice and what do we not know, as with most questions about human behavior, much more falls in the "not known" category. It is understandable, however, that estimates of tuition elasticity are closer to zero than to one. We are not trying to change people's taste for soybean products and meat. We are trying with very generalized tools to influence something as personal as an individual's decisions about himself and his future.

While it is easy then to question the effectiveness of changing tuition or aid programs as a policy tool, success is relative, and there is considerable doubt that other large public efforts in education, such as Title I or Head Start, have been any more successful.

## APPENDIX A

Defining equal access and choice in terms of participation rates affords us a simple means of measuring progress toward that goal. Access and choice, however, are concepts of equity. While it is generally agreed that equity requires that financial constraints on access and choice, within the limits of available resources, are minimized, it does not require distributing incentives in an inequitable fashion in order to raise the participation rates of certain populations.

Three alternative means of determining equal access and choice have been offered, none without shortcomings. Although the proposals are quite different, they have a common point of departure. Rather than define access and choice in terms of an output criterion, such as participation rates, and then suggest machinery to induce that particular output, they begin with the mechanism itself. The proposals attempt to devise means to reduce financial constraints across populations in an equitable manner.

One alternative is to adopt a market approach. Support for this position arises from two sources. One is the problem of making accurate assessments of a student's financial need. Eligibility formulas have particular requirements that do not always seem equitable. For example, a high school student who earns \$1,000 a year but spends it each year on consumable items will be eligible for more aid than a high school student who earns the same amount but saves it for his or her college education. As another example, a certain percent of a family's equity in real estate is included as wealth available to meet educational costs although converting the equity to cash may not be feasible.

Also, the accuracy of information reported by students and their families is dubious. Students do not estimate accurately their parents' incomes (see

for example Radner and Miller, pp. 36-39, and Miller and Radner, pp. 4-26), and even parents often do not estimate well their own income. As measured by a comparison of parent-reported figures to the College Scholarship Service and the Internal Revenue Service, at least 40 percent of the parents filing aid applications had discrepancies between the two reported taxable-income figures of at least \$500 (Bowman, 1977, p. 6). This magnitude in error is enough to question how well the program assists those people it is designed to aid.

The effectiveness of aid programs is diminished in another way. Hansen and Lampman (1974) explain how the current structure governing the conditions for which an award is made tends to reduce the variation in amount awarded per grant and often allows more affluent students to qualify more easily for financial assistance than less wealthy students. This trend in the reduction of variation in grant size over income categories counters the intention of the program. All of these problems of measurement would be eliminated with the adoption of a market system.

The second source of interest in a market system stems from the belief that there is no economic reason for society at large to pay for the post-secondary educational costs of individuals. The rationale for subsidizing education (or any other good or service) is that society receives net benefits from a person's obtaining an education that it would not otherwise receive. In the absence of any evidence that such externalities exist, some people argue that postsecondary undergraduate education should not be subsidized. With a market system, achievement of equity with respect to access would be assumed if the conditions necessary for the operation of a free market were maintained. A large loan program would be a key factor in eliminating

capital market imperfections. Loans would be available to any student at market interest rates irrespective of income or financial need.

There are a number of objections to this type of financing system. The strongest one concerns the judgment that no externalities exist. As there is no undisputed evidence that there are or are not externalities the debate over this point is likely to continue. Another contention is that low-income people would not accept the large debts necessary to obtain an education, and, if they did, the financial burden would prohibit them from engaging in routine adult financial transactions. With education priced at cost, a student might have to borrow at least \$20,000 for a college education. As an example, a young married couple, with educational loans of \$40,000, could not easily obtain a house mortgage, or even a car loan -- that would mean a payment of \$320 a month for 30 years at today's interest rates. There is already evidence that students are not willing to incur heavy educational debts. The default rate on Federally Insured Student Loans, which have a maximum of \$1,500, is about 15 percent. It seems unlikely that the default rate would decline for larger amounts.

Accepting the position that society will subsidize education to some extent, Hyde (1975) proposed that equity with respect to access and choice be measured in terms of a proportionate financial burden that a student is expected to bear for his or her education given the student's ability to pay.

Presumably the rationale for an equal access and choice policy comes from the belief that an individual should be allowed to attend an IHE as long as he or she can benefit from the experience. With no clear guideline to judge what benefits one receives from education, the decision is left to the individual of determining the worth of the education. As we are forced to allocate limited resources, it seems reasonable and equitable to provide financial assistance,

under the goal of improving access, "in proportion to a student's preference for education as revealed by the effort he is willing to make, given his ability to pay. In practical terms, aid should be related to the difference between one's educational costs and expected contribution. Undoubtedly, much turns on the calculation of expected contribution [which is a primary shortcoming of this approach] but conceptually this formulation takes into account preference for education (letting those attend who most want education) without placing a disproportionate financial constraint upon any particular choice of institution the student may make" (p. 80). Hyde proposes that each student be granted the same percentage of his or her calculated financial need where calculated financial need is equal to the cost of attendance minus the student's (or student's family's) expected contribution. Cost of attendance would equal tuition, fees, commuting costs or the cost differential of room and board at school over the alternative cost of room and board, and foregone earnings while in school (which would help offset the particularly large disincentive to attend which low-income people experience). A student's expected contribution might be calculated as it currently is or in some other way. The percentage of one's financial need met by the government would vary from year to year depending on the number of students applying for aid, their financial need and legislative appropriations.

Table A-1 presents some hypothetical figures of student costs, expected contribution and aid. The figures are complete fabrications, but are used to illustrate basic outcomes for students of different income attending institutions with different costs. Column 1 is the cost to the student. Column 2 is a schedule of expected family contribution given the student's family income. If expected contribution declines as income decreases and if the expected contribution becomes zero at some positive income level, then some negative

TABLE A-1

## HYPOTHETICAL COST, CONTRIBUTION AND AID CALCULATIONS

| (1)     |                  |             |                   | (2)                               |              | (3)                  |
|---------|------------------|-------------|-------------------|-----------------------------------|--------------|----------------------|
| Cost    |                  |             |                   | Schedule of Expected Contribution |              | Aid                  |
| Total   | Tuition and Fees | Living Exp. | Foregone Earnings | Income                            | Contribution | (20 Percent of Need) |
| \$7,000 | \$2,500          | \$500       | \$4,000           | \$ 2,000                          | \$ -500      | \$1,500              |
| 7,000   | 2,500            | 500         | 4,000             | 5,000                             | 0            | 1,400                |
| 7,000   | 2,500            | 500         | 4,000             | 10,000                            | 2,500        | 900                  |
| 7,000   | 2,500            | 500         | 4,000             | 15,000                            | 6,000        | 200                  |
| 7,000   | 2,500            | 500         | 4,000             | 20,000                            | 10,000       | 0                    |
| 8,500   | 4,000            | 500         | 4,000             | 2,000                             | -500         | 1,800                |
| 8,500   | 4,000            | 500         | 4,000             | 5,000                             | 0            | 1,700                |
| 8,500   | 4,000            | 500         | 4,000             | 10,000                            | 2,500        | 1,200                |
| 8,500   | 4,000            | 500         | 4,000             | 15,000                            | 6,000        | 500                  |
| 8,500   | 4,000            | 500         | 4,000             | 20,000                            | 10,000       | 0                    |

contribution (which in concept resembles a negative income tax) should be made for income levels below this level if a consistent relationship is to be maintained between income and expected contribution. In the first line of Table A-1, the family's income is so low that the student's costs, for purposes of computing aid, would be increased by \$500 by the expected negative contribution. Column 3 is the amount of aid a student would receive if federal appropriations were such as to allow support at 20 percent of calculated need.

Interpreting the first line, a student from a family with income of \$2,000 and attending an institution that charges \$2,500 in tuition and \$500 in additional living expenses (room and board costs beyond what he would incur if he lived at home and did not go to school) would receive \$1,500 in aid, which would cover half of his direct costs. If the same student chose to attend a school charging \$4,000 tuition, he would receive \$1,800. While the amount of aid is greater than for the less expensive school, the student is required to make a greater personal effort to attend the more expensive school.

The balance of unmet costs would be covered with loans or current income that the student might earn. The amounts given in Table A-1 are used only to illustrate this concept; they do not in any way represent levels of advocated support.

The third approach will be mentioned only briefly. The system proposed by Carlson (1977) includes in essence the same mechanism as Hyde's for making adjustments to differences in individuals' abilities to pay, and it requires a student to pay more for more expensive education. It goes beyond Hyde's proposal in that supply and demand are considered in setting the appropriate tuition level. In Carlson's words, equal access is defined as, "at a socially desirable net price or lower, the supply curve should intersect the demand curve at this net price level for all individuals."

"In other words, access would be achieved when everybody who wanted to go to college at a net price determined to be equitable would be able to enroll. The desired net price is a critical component of the definition as it should be. For example, the net price may be defined as tuition plus living expenses minus grant aid and parental contribution, and the socially desired net price may be \$200. The definition of access then is that all individuals who want to attend college at a net price of \$200 or more should be able to enroll in some institution of higher education" (p. 447).

This approach is not easily implemented because of the data requirements necessary to estimate the supply and demand curves, although if implementation were made, the system would improve the efficiency of the higher educational system.

## BIBLIOGRAPHY

- Adams, Walter. "Financing Public Higher Education." The American Economic Review (February 1977): 86-89.
- Anderson, C. Arnold, Mary Jean Bowman and Vincent Tinto. Where Colleges Are and Who Attends. New York: McGraw-Hill, 1972.
- Anderson, Richard. "Private/Public Higher Education and the Competition for High Ability Students." Journal of Human Resources. 10 (1975): 500-11.
- Astin, Alexander W. "Open Admissions and Progress for the Disadvantaged." Journal of Higher Education 42 (1971): 629-47.
- Astin, Alexander W. Financial Aid and Student Persistence. Los Angeles: Higher Education Research Institute, in progress.
- Barnes, Gary T., Edward W. Erickson, G. Watts Hill, Jr., Thomas Johnson, Donald Judd and Herbert S. Winokur, Jr. Extension of the College-Going/College-Choice Model to the NLS Class of 1971 Data. Washington, D. C.: Inner-City Fund Incorporated, June 1975.
- Baird, Leonard L. and John L. Holland. "The Flow of High School Students to Schools, Colleges and Jobs: A Re-examination of Some Old Questions by the Use of Multiple Indices of Talent." Journal of Human Resources 4, no. 1 (1969): 22-37.
- Bishop, John. "Income, Ability, and the Demand for Higher Education." Mimeographed. Madison: Institute for Research on Poverty, University of Wisconsin, November 1975.
- Bishop, John. "The Effect of Public Policies on the Demand for Higher Education." The Journal of Human Resources 12, no. 3 (Summer 1977): 286-307.
- Boskin, M. J. "A Conditional Logit Model of Occupational Choice." Journal of Political Economy 82 (1974): 389-98.
- Bowen, William G. "Economic Problems Confronting Higher Education: An Institutional Perspective." The American Economic Review (February 1977): 96-100.
- Bowman, James L. "The Impact of Time of Filing on the Accuracy of Parents' Taxable Income Reports for the 1974-75 Processing Year." Princeton, New Jersey: Educational Testing Service, 1977.
- Boyd, Joseph D. "An Examination of State Efforts to Remove Financial Barriers to Postsecondary Education." Trends in Postsecondary Education. Washington, D. C.: U. S. Department of Health, Education and Welfare, 1970, pp. 57-68.

- Boyd, Joseph D. 1973-74 Undergraduate Comprehensive State Scholarship/Grant Programs: Fifth Annual Survey. Deerfield: Illinois State Scholarship Commission. ED 084 956.
- Boyd, Joseph D., comp. National Association of State Scholarship and Grant Programs, 8th Annual Survey, 1976-77 Academic Year. Deerfield: Illinois State Scholarship Commission, 1977.
- Brazer, Harvey E. and Martin David. "Social and Economic Determinants of the Demand for Education." Selma J. Mushkin, ed. The Economics of Higher Education, Washington, D.C.: U.S. Government Printing Office, 1962, pp. 21-42.
- Brugel, John F., Gary P. Johnson, and Larry L. Leslie. "The Demand for Student Loans in Higher Education: A Study of Preferences and Attitudes." University Park: The Pennsylvania State University, undated. (Forthcoming in Research in Higher Education.)
- Campbell, R. and B. Siegel. "The Demand for Higher Education in the United States, 1919-1964." American Economic Review (June 1967): 482-94.
- Carbone, Robert F. Alternative Tuition Systems. Iowa City: The American College Testing Program, 1974.
- Carlson, Daryl E. "Student Price Response Coefficients for Grants, Loans, Work-Study Aid, and Tuition Changes: An Analysis of Student Surveys." Unpublished manuscript. Davis: Department of Agricultural Economics, University of California, November 1974.
- Carlson, Daryl E. A Flow of Funds Model for Assessing the Impact of Alternative Student Aid Programs. Stanford, California: Stanford Research Institute, 1975.
- Carlson, Daryl E. Student Access and Federal Student Aid Programs: A State by State Analysis of Higher Education Financing. Davis: University of California, February 1977, draft.
- Carnegie Foundation for the Advancement of Teaching. More than Survival: Prospects for Higher Education in a Period of Uncertainty. San Francisco, California: Jossey-Bass, Inc., Publishers, 1975.
- Carroll, Stephen J. and Daniel A. Relles. A Bayesian Model of Choice Among Higher Education Institutions. Santa Monica, California: The Rand Corporation, 1976.
- Carroll, Stephen J., Bryand M. Mori, Daniel A. Relles and David J. Weinschrott. The Enrollment Effects of Federal Student Aid Policies. Santa Monica, California: The Rand Corporation, June 1977.

Cheit, Earl F. "The Benefits and Burdens of Federal Financial Assistance to Higher Education." The American Economic Review (February 1977): 90-95.

Christensen, Sandra, John Melder and Burton A. Weisbrod. "Factors Affecting College Attendance." Journal of Human Resources 10, no. 2 (Spring 1975): 174-88.

College Entrance Examination Board. Toward Equal Opportunity for Higher Education: Report of the Panel on Financing Low-Income and Minority Students in Higher Education. New York: College Entrance Examination Board, 1973.

Columbia Research Associates. The Cost of College: II. A report prepared for the Office of Program Planning and Evaluation, U. S. Office of Education, under contract no. OCE-O-70-5023. Cambridge, Massachusetts: Columbia Research Associates, August 1972.

The Committee for Economic Development. The Management and Financing of Colleges. New York: The Committee for Economic Development, 1973.

Corrazzini, A., D. Dugan and H. Grabowski. "Determinants and Distributional Aspects of Enrollment in U. S. Higher Education." Journal of Human Resources. (Winter 1972): 39-50.

Crean, John F. "Foregone Earnings and the Demand for Education: Some Empirical Evidence." Canadian Journal of Economics. no. 6 (February 1973): 23-42.

Daniere, A. Higher Education in the American Economy. New York: Random House, 1964.

Doermann, Humphrey. "The Demand for College Education in the United States." Ph.D. Dissertation, Graduate School of Education, Harvard University, 1967.

Dole, Arthur A. and David J. Weiss. "Correlates of the Reported Determinants of College Attendance." Journal of Counseling Psychology 15, no. 5 (1968): 451-58.

Douvan, Elizabeth and Carol Kay. "Motivational Factors in College Entrance." The American College. Edited by Nevitt Sanford. New York: John Wiley and Sons, Inc., 1962, pp. 193-223.

Dresch, Stephen P. Comprehensive Planning Models for Postsecondary Education; Current Feasibility and Potential Relevance. Yale University, Institution of Social and Policy Studies, August 1974.

Dresch, Stephen P. "Demography, Technology, and Higher Education: Toward a Formal Model of Educational Adaptation." Journal of Political Economy 83 (June 1975): 535-69.

Education Commission of the States. Financing Postsecondary Education: Policy Development and Decision Making. Paper read at a regional conference, September 1974, at the Education Commission of the States, Denver, Colorado.

El-Khawas, E. H., and J. L. Kinzer. The Impact of Office of Education Student Assistance Programs, Fall 1973. Washington, D. C.: American Council on Education, April 1974.

Feldman, Paul and Stephen A. Hoenack. "Private Demand for Higher Education in the United States." In the Economics and Financing of Higher Education in the United States. A compendium of papers submitted to the Joint Economic Committee, Congress of the United States. Washington, D. C.: U. S. Government Printing Office, 1969, pp. 375-98.

Fenske, R. H., and Boyd J. D. "The Impact of State Financial Aid to Students on Choice of Public or Private Colleges." College and University 46 (1974): 98-107.

Fife, Jonathan D. Applying the Goals of Student Financial Aid. Washington, D. C.: American Association for Higher Education, 1975.

Fife, Jonathan D. and Larry L. Leslie. "The College Student Grant Study: The Effectiveness of Student Grant and Scholarship Programs in Promoting Equal Educational Opportunity." Research in Higher Education 4 (1976): 317-33.

Friedman, N. The National Educational Opportunity Grant Program: A Status Report, Fiscal Year 1970. New York: Bureau of Applied Social Research, Columbia University, 1971.

Friedman, N., L. W. Sanders and J. Thompson. The Federal College Work-Study Program. New York: Bureau of Applied Social Research, Columbia University, 1973.

Froomkin, Joseph. Aspirations, Enrollments, and Resources: The Challenge to Higher Education in the Seventies. Washington, D. C.: U. S. Office of Education, Department of Health, Education and Welfare, June 1970.

Funk, Herbert J. "Price Elasticity of Demand for Education at a Private University." Journal of Educational Research 66, no. 3 (November 1972): 130-34.

Galper, H. and R. Dunn, Jr. "A Short-Run Demand Function for Higher Education in the United States." Journal of Political Economy (September-October 1969): 765-77.

Ghali, Moheb, Walter Miklius and Richard Wada. "The Demand for Higher Education Facing an Individual Institution." Mimeographed. Honolulu: University of Hawaii, 1974. (Will appear in Higher Education, November 1977).

Goggin, W. J. The Measurement of Economic Well-Being in Need Analysis Models. Iowa City, Iowa: The Research and Development Division, The American College Testing Program, No. 66, August 1974.

Hansen, W. Lee. "An Examination of Financial Barriers to College Attendance." Trends in Postsecondary Education. Washington, D.C.: U.S. Department of Health, Education and Welfare, 1970, pp. 31-55.

- Hansen, W. Lee and Robert Lampman. "Basic Opportunity Grants for Higher Education: Good Intentions and Mixed Results." Challenge 17 (November/December 1974): 46-51.
- Hight, Joseph E. "The Demand for Higher Education in the U.S. 1927-72; The Public and Private Institutions." The Journal of Human Resources 10, no. 4 (Fall 1975): 512-20.
- Hoenack, Stephen A. "Private Demand for Higher Education in California." Ph.D. thesis, University of California at Berkeley, 1967.
- Hoenack, Stephen A. and P. Feldman. "Private Demand for Higher Education in the United States." Arlington, Virginia: Institute for Defense Analysis, August 1969. Research Paper P-649.
- Hoenack, Stephen A. and William C. Weiler. "Cost-Related Tuition Policies and University Enrollments." Journal of Human Resources 10, no. 3 (1975): 332-60.
- Hoenack, Stephen A. and William C. Weiler. The Demand for Higher Education and Institutional Enrollment Forecasting. Mimeographed. Minneapolis: Management Information Division, Office of Management Planning and Information Services, University of Minnesota, August 1977.
- Hopkins, Thomas D. "The Profision of Higher Education: A Market Interpretation." Ph.D. thesis, Yale University, 1971.
- Hopkins, Thomas D. "Higher Education Enrollment Demand." Economic Inquiry 12 (March 1974): 50-65.
- Hyde, William D., Jr. "Student Financial Aid for Higher Education: An Evaluation of Proposed Federal Legislation." In Proceedings of the National Academy of Education, Vol. 2, 1975. Stanford, California: National Academy of Education, 1975.
- Jackson, Gregory A. "Financial Aid to Students and the Demand for Postsecondary Education." Ph.D. thesis, Harvard University, 1977.
- Jackson, Gregory A. and George B. Weathersby. "Individual Demand for Higher Education: A Review and Analysis of Recent Empirical Studies." Journal of Higher Education 46 (1975): 623-52.
- Jencks, Christopher. "Social Stratification and Higher Education." Harvard Educational Review 38 (1970): 277-316.
- Kirschling, Wayne and Rudy Postweiler. General Institutional Assistance: A Scheme that Depends on the educational Efforts of the States and the Attendance Choice of Students. Boulder, Colorado: National Center for Higher Education Management Systems at Western Interstate Commission for Higher Education, December 1971.
- Knudsen, Odin K. and Paul J. Servelle. "The Demand for Higher Education at Private Institutions of Moderate Selectivity." American Economist (Fall, 1977).

- Kohn, Meir G., Charles F. Manski and David S. Mundel. "An Empirical Investigation of Factors Which Influence College-Going Behavior." Santa Monica, California: The Rand Corporation, September 1974.
- Lawrence, Ben and Wayne Kirschling. A Proposal to Fund States on the Basis of Their Support of Higher Education. Boulder, Colorado: National Center for Higher Education Management Systems at Western Interstate Commission for Higher Education, 1974.
- Lee, John B., Daryl E. Carlson, Jerry S. Davis and Ann M. Hershberger. Student Aid: Description and Options. Menlo Park, California: Stanford Research Institute, 1975.
- Leontief, Wassily. "Theoretical Assumptions and Non-observed Facts." American Economic Review 81 (March 1971): 1-7.
- Leslie, Larry L. Higher Education Opportunity: A Decade of Progress. Monograph. Washington, D. C.: American Association for Higher Education, 1977.
- Leslie, Larry L. and Jonathan D. Fife. "The College Student Grant Study." Journal of Higher Education 45, no. 9 (December 1974): 651-71.
- Leslie, Larry L. and Gary P. Johnson. "The Market Model and Higher Education." Journal of Higher Education 45, no. 1 (January 1974): 1-20.
- Leslie, Larry L., Gary P. Johnson and James Carlson. "The Impact of Need-Based Student Aid Upon the College Attendance Division." Journal of Education Finance 2 (Winter 1977): 269-85.
- McCaffery, Kenneth J. and Elaine King (eds). College/Career Choice. Iowa City, Iowa: American College Testing, 1973.
- McFadden, D. "Conditional Logit Analysis of Qualitative Choice Behavior." Berkeley: Institute of Urban and Regional Development, University of California, May 1973.
- McFadden, D. "The Revealed Preferences of a Government Bureaucracy." The Bell Journal of Economics, Part I (Spring 1976): 55-72.
- McPherson, Michael S. "The Effects of Public on Private College Enrollment." Ph.D. thesis. University of Chicago, 1974.
- McPherson, Michael S. "The Demand for Private Higher Education." In Public Policy and Private Higher Education. Edited by David G. Breneman, Chester E. Finn, and Susan C. Nelson. Washington, D. C.: The Brookings Institution, 1978, in press.
- Medsker, Leland, et al. Extending Opportunities for a College Degree: Practices, Problems, and Potentials. Berkeley: Center for Research and Development in Higher Education, University of California, 1975.

- Medsker, L. L. and J. W. Trent. Beyond High School: A Study of 10,000 High School Graduates. Berkeley: Center for Research and Development, University of California, 1967.
- Miller, Leonard S. and Roy Radner. Demand and Supply in United States Higher Education: A Technical Supplement. Berkeley, California: Carnegie Foundation for the Advancement of Teaching, 1975.
- National Center for Education Statistics. Digest of Education Statistics: 1976 Edition. Washington, D. C.: U. S. Government Printing Office, 1977.
- National Commission on the Financing of Postsecondary Education. Financing Postsecondary Education in the United States. Washington, D. C.: U. S. Government Printing Office, December 1973.
- National Commission on the Financing of Postsecondary Education. A Framework for Analyzing Postsecondary Education Financing Policies. Washington, D. C.: U. S. Government Printing Office, May 1974.
- Newton, Jan N., et al. Developing an Empirical Test of the Impact of Vouchers on Elasticity of Demand for Post-Secondary Education and on the Financing of Higher Education; and Economic Efficiency in Post-Secondary Education: Final Project Report. Eugene: University of Oregon, December 1975. ED 132 953.
- Orwig, M. D. Toward More Equitable Distribution of College Student Aid Funds: Problems in Assessing Student Financial Need. Iowa City: The Research and Development Division, The American College Testing Program, No. 43, May 1971.
- Orwig, M. D. and Paul K. Jones. Can Financial Need Analysis Be Simplified? Iowa City: The Research and Development Division, The American College Testing Program, No. 33, March 1970.
- Ostar, A. W. and W. M. Wilkinson. "Why Pricing Policies Won't Work for Education, But Free Market Concept Might." College and University Journal 56 (June 1974): 22-25.
- Ostheimer, Richard H. Student Changes and Financing Higher Education. New York: Columbia University Press, 1953.
- Peltzman, Sam. "The Effect of Government Subsidies-in-Kind on Private Expenditures: The Case of Higher Education." Journal of Political Economy 81 (January/February 1973): 1-27.
- Prediger, Dale. "Biographic Data Differentiating College Attenders from Non-Attenders at Various Ability Levels." Measurement, Evaluation, and Guidance 2 (1970): 217:24.
- Radner, R. and L. S. Miller. Demand and Supply in U. S. Higher Education. New York: McGraw-Hill, 1975.

Reeher, Kenneth R. and Earl R. Fielder. A Critical Review and Analysis of the Federal Basis Educational Opportunity Grants Program and its Effects on the Pennsylvania Higher Education Grant Program. Harrisburg: Pennsylvania Higher Education Assistance Agency, January 1976.

Roark, Anne. C. "Playing the Student-Aid Game." The Chronicle of Higher Education 15, no. 7 (October 17, 1977): 6-7.

Sandness, W. J. An Appraisal of the Illinois State Scholarship Program as a Means of Financing Higher Education Through Individual Grants to Students. E.Ed. dissertation, Indiana University, 1966.

Sloan, Frank A. "The Demand for Higher Education: The Case of Medical School Applicants." Journal of Human Resources 4, no. 4 (Fall 1971): 466-89.

Solomon, Lewis C. and Paul J. Taubman, eds. Does College Matter? New York: Academic Press, 1973.

Spies, Richard R. The Future of Private Colleges: The Effect of Rising Costs on College Choice. Princeton, New Jersey: Industrial Relations Section, Princeton University, 1973.

Stordahl, Kalmer E. "Student Perceptions of Influences on College Choice." The Journal of Educational Research 63, no. 5 (January 1970).

Systems, Research, Inc. "Technical Paper." Education Commission of the States' Financing Postsecondary Education: Policy Development and Decision Making, Denver, Colorado: Education Commission of the States, September 1974, pp. 70-113.

Tinto, Vincent. "College Proximity and Rates of College Attendance." American Educational Research Journal 10, no. 4 (Fall 1973): 277-93.

Trent, James. "The Decision to go to College: An Accumulative Multivariate Process." Trends in Postsecondary Education. Washington, D. C.: Department of Health, Education and Welfare, 1970, pp. 1-30.

Tuckman, Howard P. "Local Colleges and the Demand for Higher Education: The Enrollment Including Effects of Location." American Journal of Economics and Sociology 32 (July 1973): 257-68.

Tuckman, Howard P. and W. Scott Ford. The Demand for Higher Education: A Florida Case Study. Lexington, Massachusetts: Lexington Books, D. C. Heath and Company, 1972.

Van Alstyne, Carol and Steve Downs. "A Survey of Models of College Student Choice," (Prepared for the Student Aid Impact Study, Higher Education Research Institute, Los Angeles, California., Preliminary Draft, August 5, 1974).

- Wagner, Alan P. "The Impact of Grant Aid on Higher Education Expenditures by Low Income Families." Ph.D. dissertation. University of Illinois, Urbana-Champaign, 1977.
- Wagner, Alan P. and Lois D. Rice. Student Financial Aid: Institutional Packaging and Family Expenditure Patterns. Mimeographed. Washington, D.C.: College Entrance Examination Board, 1977. Prepared for the National Center for Education Statistics, Department of Health, Education, and Welfare. Contract No. HEW 75-22.
- Weathersby, George G. "Institutional versus Student Grant Study: A Comment." Journal of Higher Education 46 (1975): 601-6.
- Weathersby, George B. "Institutional versus Student Aid." Individualizing the System: Current Issues in Higher Education 1976, Dyckman W. Vermilye, ed. San Francisco, California: Jossey-Bass, Inc., Publishers, 1976.
- West, E. G. "Private versus Public Education: A Classical Economic Dispute." Journal of Political Economy 72 (October 1964): 465-75.
- Willett, Sandra L. "Information on Federal Student Assistance: Its Availability, Price, and Other Unfinished Business." Unpublished manuscript. Cambridge, Massachusetts: Kennedy School of Public Policy, Harvard University, March 1976.
- Windham, Douglas M. "Student Contributions Toward Post-Secondary Educational Costs: The Need for a Standard Rationale." Mimeographed. Washington, D.C.: College Scholarship Service, College Entrance Examination Board, 1976.
- Windham, Douglas M. "Economic Analysis and the Public Support of Higher Education: The Divergence of Theory and Policy." Mimeographed. Chicago: University of Chicago, 1977.